



SEQUENCE LISTING

<110> Henson, Cynthia A.  
Muslin, Elizabeth H.  
Clark, Suzanne E.

<120> Modified barley alpha-glucosidase

<130> 960296.97486

<140> 10/043,418

<141> 2002-01-10

<150> 60/260,787

<151> 2001-01-10

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<170> PatentIn Ver. 2.1

<210> 1

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<212> PRT

<213> Barley

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Thr Val Leu Ala Val Ala Val Thr Met Glu Gly Ala Leu Arg Ala Glu  
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Ala Ala Thr Gly Gly Arg Ser Ser Thr Gly Asp Val Gln Arg Leu Ala  
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Val Tyr Ala Ser Leu Glu Thr Asp Ser Arg Leu Arg Val Arg Ile Thr  
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Asp Ala Asp His Pro Arg Trp Glu Val Pro Gln Asp Ile Ile Pro Arg  
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Pro Ala Pro Gly Asp Val Leu His Asp Ala Pro Pro Ala Ser Ser Ala  
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Pro Leu Gln Gly Arg Val Leu Ser Pro Ala Gly Ser Asp Leu Val Leu

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Tyr Leu Glu Val Thr Ser Ala Leu Pro Ala Gly Arg Ala Ser Leu Tyr				
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Gly Leu Gly Glu His Thr Lys Ser Ser Phe Arg Leu Arg His Asn Asp				
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Ser Phe Thr Leu Trp Asn Ala Asp Ile Gly Ala Ser Tyr Val Asp Val				
	195		200	205
Asn Leu Tyr Gly Ser His Pro Phe Tyr Met Asp Val Arg Ala Pro Gly				
	210		215	220
Thr Ala His Gly Val Leu Leu Leu Ser Ser Asn Gly Met Asp Val Leu				
225		230		235 240
Tyr Gly Gly Ser Tyr Val Thr Tyr Lys Val Ile Gly Gly Val Leu Asp				
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Phe Tyr Phe Phe Ala Gly Pro Asn Pro Leu Ala Val Val Asp Gln Tyr				
	260		265	270
Thr Gln Leu Ile Ala Arg Pro Ala Pro Met Pro Tyr Trp Ser Phe Gly				
	275		280	285
Phe His Gln Cys Arg Tyr Gly Tyr Leu Asn Val Ser Asp Leu Glu Arg				
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Thr Asp Ile Asp Tyr Met Asp Gly Phe Lys Asp Phe Thr Leu Asp Arg				
	325		330	335
Val Asn Phe Thr Ala Ala Glu Leu Arg Pro Phe Val Asp Arg Leu His				
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370

375

380

Asp Ile Phe Leu Lys Arg Asn Gly Thr Asn Phe Val Gly Asn Val Trp  
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Pro Gly Asp Val Tyr Phe Pro Asp Phe Met His Pro Ala Ala Ala Glu  
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 420 425 430

Gly Leu Trp Ile Asp Met Asn Glu Ile Ser Asn Phe Tyr Asn Pro Glu  
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Pro Met Asn Ala Leu Asp Asp Pro Pro Tyr Arg Ile Asn Asn Asp Gly  
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Thr Gly Arg Pro Ile Asn Asn Lys Thr Val Arg Pro Leu Ala Val His  
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Tyr Gly Gly Val Thr Glu Tyr Glu Glu His Asn Leu Phe Gly Leu Leu  
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Glu Ala Arg Ala Thr Gly Arg Gly Val Leu Arg Asp Thr Gly Arg Arg  
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Pro Phe Val Leu Ser Arg Ser Thr Phe Val Gly Ser Gly Arg Tyr Thr  
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Ala Tyr Trp Thr Gly Asp Asn Ala Ala Thr Trp Gly Asp Leu Arg Tyr  
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Ser Ile Asn Thr Met Leu Ser Phe Gly Leu Phe Gly Met Pro Met Ile  
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Gly Ala Asp Ile Cys Gly Phe Asn Gly Asn Thr Thr Glu Glu Leu Cys  
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Gly Arg Trp Ile Gln Leu Gly Ala Phe Tyr Pro Phe Ser Arg Asp His  
 580 585 590

Ser Ala Ile Phe Thr Val Arg Arg Glu Leu Tyr Leu Trp Pro Ser Val  
 595 600 605

Ala Ala Ser Gly Arg Lys Ala Leu Gly Leu Arg Tyr Gln Leu Leu Pro  
 610 615 620

Tyr Phe Tyr Thr Leu Met Tyr Glu Ala His Met Thr Gly Ala Pro Ile

625                      630                      635                      640  
 Ala Arg Pro Leu Phe Phe Ser Tyr Pro His Asp Val Ala Thr Tyr Gly  
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 Leu Glu Pro Gly Pro Thr Thr Val Asp Ala Tyr Phe Pro Ala Gly Arg  
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 Trp Tyr Arg Leu Tyr Asp Tyr Ser Leu Ala Val Ala Thr Arg Thr Gly  
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 Lys His Val Arg Leu Pro Ala Pro Ala Asp Thr Val Asn Val His Leu  
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 Thr Gly Gly Thr Ile Leu Pro Leu Gln Gln Ser Ala Leu Thr Thr Ser  
                                 725                      730                      735  
 Arg Ala Arg Arg Thr Ala Phe His Leu Leu Val Ala Leu Ala Glu Asp  
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 Gly Thr Ala Ser Gly Tyr Leu Phe Leu Asp Asp Gly Asp Ser Pro Glu  
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 Tyr Gly Arg Arg Ser Asp Trp Ser Met Val Arg Phe Asn Tyr Lys Ile  
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 Pro Asn Asn Lys Gly Ala Ile Lys Val Lys Ser Glu Val Val His Asn  
 785                                  790                      795                      800  
 Ser Tyr Ala Gln Ser Arg Thr Leu Val Ile Ser Lys Val Val Leu Met  
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 Gly His Arg Ser Pro Ala Ala Pro Lys Lys Leu Thr Val His Val Asn  
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 Ser Ala Glu Val Glu Ala Ser Ser Ser Ala Gly Thr Arg Tyr Gln Asn  
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 Ala Gly Gly Leu Gly Gly Val Ala His Ile Gly Gly Leu Ser Leu Val  
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Asn	Ala	Lys	Val	Asp	Asn	Ser	Thr	Gly	Lys	Ser	Leu	Thr	Ala	Leu	Leu
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Gln	Leu	Ile	Arg	Asn	Ser	Pro	Val	Tyr	Gly	Pro	Asp	Ile	His	Phe	Leu
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Ser	Phe	Thr	Ala	Ser	Phe	Glu	Glu	Asp	Asp	Thr	Leu	Arg	Ile	Arg	Phe
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Thr	Asp	Ala	Asn	Asn	Arg	Arg	Trp	Glu	Ile	Pro	Asn	Glu	Val	Leu	Pro
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Arg	Pro	Pro	Pro	Pro	Pro	Ser	Pro	Pro	Pro	Leu	Ser	Ser	Leu	Gln	His
		115					120					125			
Leu	Pro	Lys	Pro	Ile	Pro	Gln	Asn	Gln	Pro	Thr	Thr	Thr	Val	Leu	Ser
	130					135					140				
His	Pro	His	Ser	Asp	Leu	Ala	Phe	Thr	Leu	Phe	His	Thr	Thr	Pro	Phe
145					150					155					160
Gly	Phe	Thr	Ile	Tyr	Arg	Lys	Ser	Thr	His	Asp	Val	Leu	Phe	Asp	Ala
			165						170					175	
Thr	Pro	Ile	Pro	Ser	Asn	Pro	Thr	Thr	Phe	Leu	Ile	Tyr	Lys	Asp	Gln
			180					185					190		
Tyr	Leu	Gln	Leu	Ser	Ser	Ser	Leu	Pro	Ala	Gln	Gln	Ala	His	Leu	Tyr
		195					200					205			
Gly	Leu	Gly	Glu	His	Thr	Lys	Pro	Thr	Phe	Gln	Leu	Ala	His	Asn	Gln
	210					215					220				

Ile	Leu	Thr	Leu	Trp	Asn	Ala	Asp	Ile	Ala	Ser	Phe	Asn	Arg	Asp	Leu	225	230	235	240
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Met	Val	Gly	Ser	Thr	His	Gly	Val	Phe	Leu	Leu	Asn	Ser	Asn	Gly	Met	260	265	270	
Asp	Val	Glu	Tyr	Thr	Gly	Asp	Arg	Ile	Thr	Tyr	Lys	Val	Ile	Gly	Gly	275	280	285	
Ile	Ile	Asp	Leu	Tyr	Ile	Phe	Ala	Gly	Arg	Thr	Pro	Glu	Met	Val	Leu	290	295	300	
Asp	Gln	Tyr	Thr	Lys	Leu	Ile	Gly	Arg	Pro	Ala	Pro	Met	Pro	Tyr	Trp	305	310	315	320
Ala	Phe	Gly	Phe	His	Gln	Cys	Arg	Trp	Gly	Tyr	Arg	Asp	Val	Asn	Glu	325	330	335	
Ile	Glu	Thr	Val	Val	Asp	Lys	Tyr	Ala	Glu	Ala	Arg	Ile	Pro	Leu	Glu	340	345	350	
Val	Met	Trp	Thr	Asp	Ile	Asp	Tyr	Met	Asp	Ala	Phe	Lys	Asp	Phe	Thr	355	360	365	
Leu	Asp	Pro	Val	His	Phe	Pro	Leu	Asp	Lys	Met	Gln	Gln	Phe	Val	Thr	370	375	380	
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Ile	Asn	Thr	Asn	Lys	Ser	Tyr	Gly	Thr	Phe	Ile	Arg	Gly	Met	Gln	Ser	405	410	415	
Asn	Val	Phe	Ile	Lys	Arg	Asn	Gly	Asn	Pro	Tyr	Leu	Gly	Ser	Val	Trp	420	425	430	
Pro	Gly	Pro	Val	Tyr	Tyr	Pro	Asp	Phe	Leu	Asp	Pro	Ala	Ala	Arg	Ser	435	440	445	
Phe	Trp	Val	Asp	Glu	Ile	Lys	Arg	Phe	Arg	Asp	Ile	Leu	Pro	Ile	Asp	450	455	460	
Gly	Ile	Trp	Ile	Asp	Met	Asn	Glu	Ala	Ser	Asn	Phe	Ile	Thr	Ser	Ala	465	470	475	480

Pro Thr Pro Gly Ser Thr Leu Asp Asn Pro Pro Tyr Lys Ile Asn Asn  
 485 490 495

Ser Gly Gly Arg Val Pro Ile Asn Ser Lys Thr Ile Pro Ala Thr Ala  
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Met His Tyr Gly Asn Val Thr Glu Tyr Asn Ala His Asn Leu Tyr Gly  
 515 520 525

Phe Leu Glu Ser Gln Ala Thr Arg Glu Ala Leu Val Arg Pro Ala Thr  
 530 535 540

Arg Gly Pro Phe Leu Leu Ser Arg Ser Thr Phe Ala Gly Ser Gly Lys  
 545 550 555 560

Tyr Thr Ala His Trp Thr Gly Asp Asn Ala Ala Arg Trp Asp Asp Leu  
 565 570 575

Gln Tyr Ser Ile Pro Thr Met Leu Asn Phe Gly Leu Phe Gly Met Pro  
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Met Ile Gly Ala Asp Ile Cys Gly Phe Ala Glu Ser Thr Thr Glu Glu  
 595 600 605

Leu Cys Cys Arg Trp Ile Gln Leu Gly Ala Phe Tyr Pro Phe Ser Arg  
 610 615 620

Asp His Ser Ala Arg Asp Thr Thr His Gln Glu Leu Tyr Leu Trp Glu  
 625 630 635 640

Ser Val Ala Ala Ser Ala Arg Thr Val Leu Gly Leu Arg Tyr Glu Leu  
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Leu Pro Tyr Tyr Tyr Thr Leu Met Tyr Asp Ala Asn Leu Arg Gly Ser  
 660 665 670

Pro Ile Ala Arg Pro Leu Ser Phe Thr Phe Pro Asp Asp Val Ala Thr  
 675 680 685

Tyr Gly Ile Ser Ser Gln Phe Leu Ile Gly Arg Gly Ile Met Val Ser  
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Pro Val Leu Gln Pro Gly Ser Ser Ile Val Asn Ala Tyr Ser Pro Arg  
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Gly Asn Trp Val Ser Leu Ser Asn Tyr Thr Ser Ser Val Ser Val Ser  
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Ala Gly Thr Tyr Val Ser Leu Ser Ala Pro Pro Asp His Ile Asn Val  
740 745 750

His Ile His Glu Gly Asn Ile Val Ala Met Gln Gly Glu Ala Met Thr  
755 760 765

Thr Gln Ala Ala Arg Ser Thr Pro Phe His Leu Leu Val Val Met Ser  
770 775 780

Asp His Val Ala Ser Thr Gly Glu Leu Phe Leu Asp Asn Gly Ile Glu  
785 790 795 800

Met Asp Ile Gly Gly Pro Gly Gly Lys Trp Thr Leu Val Arg Phe Phe  
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Ala Glu Ser Gly Ile Asn Asn Leu Thr Ile Ser Ser Glu Val Val Asn  
820 825 830

Arg Gly Tyr Ala Met Ser Gln Arg Trp Val Met Asp Lys Ile Thr Ile  
835 840 845

Leu Gly Leu Lys Arg Arg Val Lys Ile Lys Glu Tyr Thr Val Gln Lys  
850 855 860

Asp Ala Gly Ala Ile Lys Val Lys Gly Leu Gly Arg Arg Thr Ser Ser  
865 870 875 880

His Asn Gln Gly Gly Phe Phe Val Ser Val Ile Ser Asp Leu Arg Gln  
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Arg Val

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Glu Gly Val Ile Gly Tyr Gly Tyr Lys Val Lys Ser Val Lys Val Asp  
35 40 45

Ser Gly Thr Arg Arg Ser Leu Thr Ala Leu Pro Gln Leu Val Lys Asn  
50 55 60

Ser Ser Val Tyr Gly Pro Asp Ile Gln Leu Leu Ser Ile Thr Ala Ser  
65 70 75 80

Leu Glu Ser Asn Asp Arg Leu Arg Val Arg Ile Thr Asp Ala Lys His  
85 90 95

Arg Arg Trp Glu Ile Pro Asp Asn Ile Leu His Arg His Gln Pro Pro  
100 105 110

Pro Pro Pro Pro His Ser Leu Ser Ser Leu Tyr Arg Thr Leu Leu Ser  
115 120 125

Ser Pro Thr Thr Asn Arg Arg Lys Ile Leu Leu Ser His Pro Asn Ser  
130 135 140

Asp Leu Thr Phe Ser Leu Ile Asn Thr Thr Pro Phe Gly Phe Thr Ile  
145 150 155 160

Ser Arg Lys Ser Thr His Asp Val Leu Phe Asp Ala Thr Pro Asp Pro  
165 170 175

Thr Asn Pro Asn Thr Phe Leu Ile Phe Ile Asp Gln Tyr Leu His Leu  
180 185 190

Thr Ser Ser Leu Pro Gly Thr Arg Ala His Ile Tyr Gly Leu Gly Glu  
195 200 205

His Ser Lys Pro Thr Phe Gln Leu Ala His Asn Gln Thr Leu Thr Met  
210 215 220

Arg Ala Ala Asp Ile Pro Ser Ser Asn Pro Asp Val Asn Leu Tyr Gly  
225 230 235 240

Ser His Pro Phe Tyr Met Asp Val Arg Ser Ser Pro Val Ala Gly Ser  
245 250 255

Thr His Gly Val Leu Leu Leu Asn Ser Asn Gly Met Asp Val Glu Tyr  
260 265 270

Thr Gly Asn Arg Ile Thr Tyr Lys Val Ile Gly Gly Ile Ile Asp Leu  
275 280 285

Tyr Phe Phe Ala Gly Pro Ser Pro Gly Gln Val Val Glu Gln Phe Thr  
 290 295 300  
 Arg Val Ile Gly Arg Pro Ala Pro Met Pro Tyr Trp Ala Phe Gly Phe  
 305 310 315 320  
 Gln Gln Cys Arg Tyr Gly Tyr His Asp Val Tyr Glu Leu Gln Ser Val  
 325 330 335  
 Val Ala Gly Tyr Ala Lys Ala Lys Ile Pro Leu Glu Val Met Trp Thr  
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 Asp Ile Asp Tyr Met Asp Ala Tyr Lys Asp Phe Thr Leu Asp Pro Val  
 355 360 365  
 Asn Phe Pro Leu Asp Lys Met Lys Lys Phe Val Asn Asn Leu His Lys  
 370 375 380  
 Asn Gly Gln Lys Tyr Val Val Ile Leu Asp Pro Gly Ile Ser Thr Asn  
 385 390 395 400  
 Lys Thr Tyr Glu Thr Tyr Ile Arg Gly Met Lys His Asp Val Phe Leu  
 405 410 415  
 Lys Arg Asn Gly Lys Pro Tyr Leu Gly Ser Val Trp Pro Gly Pro Val  
 420 425 430  
 Tyr Phe Pro Asp Phe Leu Lys Pro Ser Ala Leu Thr Phe Trp Thr Asp  
 435 440 445  
 Glu Ile Lys Arg Phe Leu Asn Leu Leu Pro Val Asp Gly Leu Trp Ile  
 450 455 460  
 Asp Met Asn Glu Ile Ser Asn Phe Ile Ser Ser Pro Pro Ile Pro Gly  
 465 470 475 480  
 Ser Thr Leu Asp Asn Pro Pro Tyr Lys Ile Asn Asn Ser Gly Val Met  
 485 490 495  
 Leu Pro Ile Ile Asn Lys Thr Ile Pro Pro Thr Ala Met His Tyr Gly  
 500 505 510  
 Asp Ile Pro Glu Tyr Asn Val His Asn Leu Phe Gly Tyr Leu Glu Ala  
 515 520 525  
 Arg Val Thr Arg Ala Ala Leu Ile Lys Leu Thr Glu Lys Arg Pro Phe  
 530 535 540

Val Leu Ser Arg Ser Thr Phe Ser Gly Ser Gly Lys Tyr Thr Ala His  
 545 550 555 560  
 Trp Thr Gly Asp Asn Ala Ala Thr Trp Asn Asp Leu Val Tyr Ser Ile  
 565 570 575  
 Pro Ser Met Leu Asp Phe Gly Leu Phe Gly Ile Pro Met Val Gly Ala  
 580 585 590  
 Asp Ile Cys Gly Phe Leu Gly Asn Thr Thr Glu Glu Leu Cys Arg Arg  
 595 600 605  
 Trp Ile Gln Leu Gly Ala Phe Tyr Pro Phe Ser Arg Asp His Ser Ser  
 610 615 620  
 Leu Gly Thr Thr Tyr Gln Glu Leu Tyr Arg Trp Glu Ser Val Ala Ala  
 625 630 635 640  
 Ser Ala Arg Lys Val Leu Gly Leu Arg Tyr Thr Leu Leu Pro Tyr Phe  
 645 650 655  
 Tyr Thr Leu Met Tyr Glu Ala Gln Leu Asn Gly Ile Pro Ile Ala Arg  
 660 665 670  
 Pro Leu Phe Phe Ser Phe Pro Asp Asp Ile Lys Thr Tyr Gly Ile Ser  
 675 680 685  
 Ser Gln Phe Leu Leu Gly Lys Gly Val Met Val Ser Pro Val Leu Lys  
 690 695 700  
 Pro Gly Val Val Ser Val Thr Ala Tyr Phe Pro Arg Gly Asn Trp Phe  
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 Asp Leu Phe Asp Tyr Thr Arg Ser Val Thr Ala Ser Thr Gly Arg Tyr  
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 Val Thr Leu Ser Ala Pro Pro Asp His Ile Asn Val His Ile Gln Glu  
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 Gly Asn Ile Leu Ala Met Gln Gly Lys Ala Met Thr Thr Gln Ala Ala  
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 Arg Lys Thr Pro Phe His Leu Leu Val Val Met Ser Asp Cys Gly Ala  
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 Ser Phe Gly Glu Leu Phe Leu Asp Asp Gly Val Glu Val Thr Met Gly  
 785 790 795 800

Val Asn Arg Gly Lys Trp Thr Phe Val Lys Phe Ile Ala Ala Ser Ala  
805 810 815

Lys Gln Thr Cys Ile Ile Thr Ser Asp Val Val Ser Gly Glu Phe Ala  
820 825 830

Val Ser Gln Lys Trp Val Ile Asp Lys Val Thr Ile Leu Gly Leu Arg  
835 840 845

Lys Gly Thr Lys Ile Asn Gly Tyr Thr Val Arg Thr Gly Ala Val Thr  
850 855 860

Arg Lys Gly Asp Lys Ser Lys Leu Lys Ser Thr Pro Asp Arg Lys Gly  
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Glu Phe Ile Val Ala Glu Ile Ser Gly Leu Asn Leu Leu Leu Gly Arg  
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Glu Phe Lys Leu Val Leu His  
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Thr Val Val Gly Tyr Gly Tyr Val Val Arg Ser Val Gly Val Asp Ser  
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Asn Arg Gln Val Leu Thr Ala Lys Leu Asp Leu Ile Lys Pro Ser Ser  
50 55 60

Val Tyr Ala Pro Asp Ile Lys Ser Leu Asn Leu His Val Ser Leu Glu  
65 70 75 80

Thr Ser Glu Arg Leu Arg Ile Arg Ile Thr Asp Ser Ser Gln Gln Arg  
85 90 95

Trp Glu Ile Pro Glu Thr Val Ile Pro Arg Ala Gly Asn His Ser Pro

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Arg	Arg	Phe	Ser	Thr	Glu	Glu	Asp	Gly	Gly	Asn	Ser	Pro	Glu	Asn	Asn	
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Phe	Leu	Ala	Asp	Pro	Ser	Ser	Asp	Leu	Val	Phe	Thr	Leu	His	Asn	Thr	
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Gly	Ser	Lys	Gly	Asn	Glu	Glu	Ala	Gly	Thr	Thr	His	Gly	Val	Leu	Leu	
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Leu	Asn	Ser	Asn	Gly	Met	Asp	Val	Lys	Tyr	Glu	Gly	His	Arg	Ile	Thr	
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Tyr	Asn	Val	Ile	Gly	Gly	Val	Ile	Asp	Leu	Tyr	Val	Phe	Ala	Gly	Pro	
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Ala	Gly	Ile	Pro	Leu	Glu	Val	Met	Trp	Thr	Asp	Ile	Asp	Tyr	Met	Asp	
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Gly	Tyr	Lys	Asp	Phe	Thr	Leu	Asp	Pro	Val	Asn	Phe	Pro	Glu	Asp	Lys	

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 Met Gln Ser Phe Val Asp Thr Leu His Lys Asn Gly Gln Lys Tyr Val  
 370                      375                      380  
 Leu Ile Leu Asp Pro Gly Ile Gly Val Asp Ser Ser Tyr Gly Thr Tyr  
 385                      390                      395                      400  
 Asn Arg Gly Met Glu Ala Asp Val Phe Ile Lys Arg Asn Gly Glu Pro  
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 Tyr Leu Gly Glu Val Trp Pro Gly Lys Val Tyr Phe Pro Asp Phe Leu  
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 Asn Pro Ala Ala Ala Thr Phe Trp Ser Asn Glu Ile Lys Met Phe Gln  
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 Glu Ile Leu Pro Leu Asp Gly Leu Trp Ile Asp Met Asn Glu Leu Ser  
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 Asn Phe Ile Thr Ser Pro Leu Ser Ser Gly Ser Ser Leu Asp Asp Pro  
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 Thr Val Pro Ala Thr Ser Ile His Phe Gly Asn Ile Ser Glu Tyr Asp  
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 Ala His Asn Leu Tyr Gly Leu Leu Glu Ala Lys Ala Thr His Gln Ala  
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 Val Val Asp Ile Thr Gly Lys Arg Pro Phe Ile Leu Ser Arg Ser Thr  
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 Phe Val Ser Ser Gly Lys Tyr Thr Ala His Trp Thr Gly Asp Asn Ala  
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 Ala Lys Trp Glu Asp Leu Ala Tyr Ser Ile Pro Gly Ile Leu Asn Phe  
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 Asp Ala Tyr Phe Pro Ala Gly Asn Trp Phe Asp Leu Phe Asn Tyr Ser  
 705                      710                      715                      720  
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 Gln Gly Glu Ala Leu Thr Thr Arg Asp Ala Arg Lys Thr Pro Tyr Gln  
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 Leu Leu Val Val Ala Ser Arg Leu Glu Asn Ile Ser Gly Glu Leu Phe  
                     770                      775                      780  
 Leu Asp Asp Gly Glu Asn Leu Arg Met Gly Ala Gly Gly Gly Asn Arg  
 785                      790                      795                      800  
 Asp Trp Thr Leu Val Lys Phe Arg Cys Tyr Val Thr Gly Lys Ser Val  
                     805                      810                      815  
 Val Leu Arg Ser Glu Val Val Asn Pro Glu Tyr Ala Ser Lys Met Lys  
                     820                      825                      830  
 Trp Ser Ile Gly Lys Val Thr Phe Val Gly Phe Glu Asn Val Glu Asn  
                     835                      840                      845  
 Val Lys Thr Tyr Glu Val Arg Thr Ser Glu Arg Leu Arg Ser Pro Arg  
                     850                      855                      860  
 Ile Ser Leu Ile Lys Thr Val Ser Asp Asn Asp Asp Pro Arg Phe Leu

865

870

875

880

Ser Val Glu Val Ser Lys Leu Ser Leu Leu Val Gly Lys Lys Phe Glu  
885 890 895

Met Arg Leu Arg Leu Thr  
900

&lt;210&gt; 5

&lt;211&gt; 29

&lt;212&gt; DNA

&lt;213&gt; Artificial Sequence

&lt;220&gt;

<223> Description of Artificial Sequence:synthetic  
oligonucleotide

&lt;400&gt; 5

cggtgaagtt gacaggatcc aaggtgaag

29

&lt;210&gt; 6

&lt;211&gt; 30

&lt;212&gt; DNA

&lt;213&gt; Artificial Sequence

&lt;220&gt;

<223> Description of Artificial Sequence:synthetic  
oligonucleotide

&lt;400&gt; 6

gagctcggcg gcggggaagt ttacacggtc

30

&lt;210&gt; 7

&lt;211&gt; 26

&lt;212&gt; DNA

&lt;213&gt; Artificial Sequence

&lt;220&gt;

<223> Description of Artificial Sequence:synthetic  
oligonucleotide

&lt;400&gt; 7

ccaggaggtg gaacggggtc cggcgc

26